

Waste Characterization at Los Alamos National Laboratory

The Waste Isolation Pilot Plant (WIPP) has been identified as the storage location for transuranic (TRU) waste generated by defense programs.

Los Alamos National Laboratory is one of the *first* facilities to develop a process for identifying and properly documenting TRU-waste characteristics. This process was the *first* to be approved by the Department of Energy (DOE) Carlsbad Area Office and the federal Environmental Protection Agency. The Laboratory's process is a series of validation and verification steps designed to make sure waste data meet the strict objectives established in the Transuranic Waste Characterization Quality Assurance Plan.

On March 25, 1999, Los Alamos was the first to ship TRU waste to WIPP. Regarding this shipment, DOE Secretary Richardson said, "This is truly a historic moment for the Department of Energy and the nation. This shipment to WIPP represents the beginning of fulfilling the long-overdue promise to all Americans to safely clean up the nation's Cold War legacy of nuclear waste and protect the generations to come."

Meeting WIPP requirements for TRU waste storage necessitates the use of multiple characterization techniques, including real-time radiography, radioassay, headspace gas analysis, solid-waste core sampling, trace metals analysis, and visual examination. The Laboratory has developed many such state-of-the-art characterization techniques. Some are described in this document

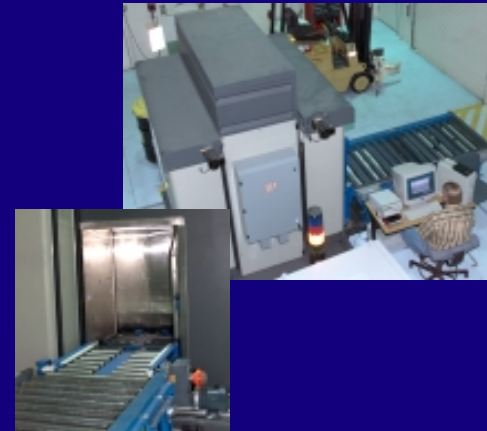
Radioassay

Determining the radioactive content of waste is one component of the characterization needed before waste is shipped to WIPP. The Laboratory accomplishes that determination with nondestructive assay methods. The Los Alamos Safeguards Science and Technology group (NIS-5) is a world leader in the development of nondestructive assay (NDA) instrumentation. The Environmental Science and Waste Technology (E) Division is a leader in testing, deploying, and certifying NDA equipment.

Two examples of Los Alamos-designed and -deployed technologies are the High Efficiency Neutron Counter (HENC) and the Tomographic Gamma Scanner (TGS).

High Efficiency Neutron Counter

The HENC is designed to assay 208-liter drums to detection levels on the order of 5 mg of ^{240}Pu , effective using count times of 4000 seconds or less. With its enhanced correction and analysis techniques, such as add-a-source and multiplicity counting, the HENC is an extremely accurate assay system.



Tomographic Gamma Scanner

The TGS is designed to assay 208-liter drums and overpack drums with detection limits of ~0.5 g of ^{239}Pu in 1 hour. The advanced matrix correction algorithms make this an extremely versatile assay system.



NIS-5 developed both technologies, and E-Division deployed and certified them for WIPP. These instruments are state-of-the-art assay systems that provide significant improvements and capability enhancements over their predecessors. These capabilities are needed for many samples that are difficult to assay. The HENC and TGS are among the best-performing NDA systems in DOE-sponsored Performance Demonstration Program (PDP) testing. Both technologies have been transferred to industry and are commercially available. The HENC and TGS were designed to assay drummed waste. NIS-5 has also used HENC technology to develop a standard waste box counter called the SuperHENC. The SuperHENC incorporates new detector, hardware, and software improvements that allow for high-sensitivity measurements on standard waste boxes. The SuperHENC is currently being certified for WIPP. Technology transfer for the SuperHENC is in progress, so the technology will soon be available commercially.

Headspace Gas

The Laboratory's Physical Organic Chemistry group, CST-12, has developed instrumentation for detecting and analyzing flammable and hazardous organic vapors that may be present in TRU waste. This instrumentation automates the collection and analysis of headspace gas samples taken from TRU waste drums. Up to 20 drums per day can be characterized using one instrument. This automated instrumentation enhances data quality characterization while providing a high throughput to meet current shipment schedules.

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SuperHENC

The SuperHENC is designed to assay 208-liter drums and standard waste boxes with a detection limit of 50 mg of plutonium.



Headspace

This instrumentation automates the collection and analysis of headspace gas samples taken from TRU waste drums. The automation enhances data quality characterization while providing a high throughput to meet current shipment schedules.

